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READERS CONTRIBUTIONS

"Automatic Gearbox Overhaul"

An article by Tony Cripps

AUTOMATIC GEARBOX OVERHAUL – PART 1

I recently acquired a very nice automatic sedan. I had no previous interest in an automatic 1800, but the car was so good in other respects, that the automatic aspect paled into insignificance. The history of this car has some bearing on what was to follow. The car had been off the road since 1980. It had been stored in the dark, in a garage for some thirty years. The tyres were flat, the paint scuffed and worn where boxes had been put on it, but the interior was absolutely pristine, even down to the genuine BMC floor mats – which alas had gone very brittle. Why had this car not been driven for so long? I was soon to find out, but not until some days after I got it home.

A very kind friend assisted me in pulling out the car from its resting place, and pushing it up onto a car trailer, driving some distance, and thence to my driveway. For some reason, it ended up in my driveway facing downhill towards the street. Naturally I spent some time in renewing the spark plugs, putting in some petrol (the original petrol having long since evaporated), and changing the oil. The engine was eventually fired up and sounded quite sweet for something not started for such a long time – except for a very loud clack from the valve gear. This was duly investigated and found to be a bent pushrod – due to one valve being stuck in a guide. The valve had freed itself, but the damage was done, and I had to find a new pushrod before proceeding any further. Luckily Club Member HS came through with the goods, and in it went, with the result that it was time to drive it onto the front lawn, turn it around, and then into the garage where more work could be done.

I sat in the driver's seat, selected D (with the right hand gear lever that protrudes from the dash) and carefully rolled with a little bit of drive, onto the lawn. All I had to do now was to put it in reverse, and then drive back into the garage nose first. Unfortunately, while the gear selector went into reverse, the gearbox did not, and no amount of coaxing would make it do so. There was nothing for it but to have the family all out on the lawn (at 10 pm) to push the thing back around so that I could get enough turning room to drive it forward into the garage. It was not an auspicious introduction for this new car to the rest of the said family. Eventually it we got it into the garage whereupon we

all went to bed, I saying a prayer to St Christopher that I would not have to pull the gearbox to pieces and that it was only a band adjustment....

Next day, the sump guard and the two oil pans were removed. A loose bolt was found in the bottom of the pan. “That shouldn’t be there” I thought. I looked up into the innards. There was the problem – a broken rear servo unit. The side of the casting had snapped off and the securing bolt with it and had dropped away leaving no chance of the band closing against the drum. All I needed was another rear servo? A hasty call to Club Member HS again (HS wondering just what obscure part I will need next every time I write). HS bought the part with him when he visited Sydney for the All British Day. Together we put the replacement servo in – but before this I had to remove the broken off end of the bolt from within the casing. Thankfully it wasn’t tight and I was able to wriggle it around and out with the sharp end of a scriber.

The band was adjusted, and for good measure, the valve body was cleaned out, and then all reassembled and oil added. Success! It clunked into reverse and HS and I could retire for the evening with a clear conscience. HS had to depart for his own domicile the next day and so I was left to carry on alone. After some days of attending to numerous other matters, it was time to take it around the block for a quick run before its official inspection for registration. Well, it went around the block OK – a bit noisy, but certainly driveable. In fact it went around the block so well that I thought I would take it around again – and got half way around when it conked out on the side of the road and wouldn’t start. By this time it was 10 pm again, and the family flatly refused to come down the road and help push the car back into our driveway so I had to leave it on the side of the road, a forlorn sight, overnight until I could see what I was doing the next morning.

At 6 am the next day, after a sleepless night of mentally going through each plan of action for repair, I was there outside some neighbours place with a box full of tools and working under the bonnet. Eventually I discovered that the choke has become stuck on and had flooded the engine. All that was needed to get things moving was to push the jet back up with my finger.

And so we went off for inspection. The inspector was very kind, and could not fault the car, but he, like I, did notice a lot of grinding noises from the front. However, he passed it, and off I went with a mission-accomplished feeling. “The family will love it” I kept saying to myself. By the time I got home, the noise from the front end was become alarming, and more curious, it only appeared when power was applied to the drive train. On overrun, everything was whisper quiet. “It’s has to be the wheel bearings” I convinced myself, so off they old ones came (all the grease had long since gone) and new ones in. You know what it’s like when you fix something, and you can tell you’ve fixed *something*, but the main problem is still there? Well, the main grinding noise was still there. I studied the workshop manual assiduously, much like a hypochondriac, seeing problems at every page. I ended up replacing the alternator bearings and the engine mounts but although these things resulted in noticeable reductions in overall noise, the grinding noise became even more apparent as all the other noises diminished. Thinking that St Christopher had let me down, I decided it would be a good idea to take the rear drive casing off – since I discovered from the workshop manual that this could be done in-situ. I was thinking that the main differential bearings were probably worn since the noise was quite a heavy sounding grinding, and with any luck, all I had to do was to replace these bearings and get out of taking the power unit out.

Well, the rear casing certainly came off OK, with some struggling with the long studs, and there was the problem. The parking pawl was loose. I could just imagine the peg of it rubbing up against the outer ring gear when the engine rotated about its axis. When I took the pawl assembly out, I found that the rod through the middle had worked its way out to one side allowing the lever to just rattle around and do very little. I pushed the rod in, and found that there was a raised section design to be an interference fit in the housing to keep it there. I put a bit of loctite on there for good measure, and then sat back and had a think. Well, there was certainly a problem, but since I had the rear casing off, I also remembered that one could also remove the speedometer drive end cover as well, and there it was all in front of me. Should I just put the rear casing back on, or should I continue with further investigation just in case. After agonising over this for another hour, I decided to take the cover off. I had read in the manual about some O rings that needed to seal properly in this casing otherwise there would be problems with reverse, so this was the main motivation. The O rings certainly looked OK, and I was just about to put the cover back on when by the purest chance, or perhaps a divine intervention from St C, I put my hand on the main gearbox output shaft which was by now, sticking out the end in an inviting manner.

AUTOMATIC GEARBOX OVERHAUL – PART 2

As readers of this august publication will know, we are half way through my experience in getting my newly acquired MKII auto sedan back on the road. In Part 1, we got to the point where the end cover of the gearbox had been removed and I had put my hand up and onto the output mainshaft which was sticking out and clearly accessible. To my horror, the output shaft went up and down about 2 mm. Hmmm, it shouldn't do that. I could then see that the whole output gear train could move up and down and back and forward quite a bit.

In looking at the 1800 workshop manual (orange), there was a very comprehensive repair guide for the auto and I could see there should be a large double row ball bearing there near the output pinion. It felt to me like this bearing wasn't doing anything. Closer inspection of the inside of the gearbox casing around the governor then revealed what the grinding noise was. On the application of power, the output shaft moved so much that the outer end of the governor was grinding its way through the alloy housing. There's only about a 1mm of clearance there anyway, and this had been well and truly taken up with nice grooves now in the case. There was nothing for it then, but to take out the power unit and have a look at this bearing.

Many readers will be experienced in power unit removal on an 1800, but this was only my second go. The last time, on another car, I hoisted the whole lot out from the top. Club Member HS advised me that lifting the car and removal from the bottom was easier, and so I decided to have a go, and yes, it is far easier to do it this way. Plus, you can easily wheel the power unit over to some other place to work on it while the remainder of the car is left up in the air. I found out later that in principle, one could just drop the auto box away from the engine with the engine left in situ, something perhaps to try next time.

I discovered that to get to this bearing, every single individual item from the automatic gearbox has to be removed first. It is the first thing to go back in on reassembly. After filling up many tables of parts, carefully placed in sequence, I got to the stage of removing the bearing casing. Off it came and several balls spilled out onto the floor. Now, this bearing is a fairly large affair with two rows of balls

which are held in position by two brass cages on each side. The strange thing was that the brass cage was there on one side, but no sign of it on the other. This cage is quite a large item, and occasionally they break, but here, there was just no sign of it at all, and worse, the bearing casing which fits over the whole thing means that there is nowhere for it to go. There was no sign of any brass shavings in the oil, and the only conclusion I can come to is that someone kindly left it out when the gearbox was initially assembled. The whole thing was really only running on one side of the bearing, and no wonder it wore out after only 60000 miles.

Of course, this bearing was not available anywhere in Australia and I soon became very familiar with all the bearing houses in the country. It was a Ransom and Marles bearing, quite a well known company in their day, and to my surprise, they still had a web site in UK. I found out later that R&M actually went out of business with the "R" side going to RHP. This place in UK appeared genuine enough, and even had the bearing in stock, but at an eye-watering $350. The outer ring of this bearing is about an inch wide. During my investigations, I found a very good bearing supplier in Yennora (Sydney) who had a very similar bearing but the outer ring was about 5 mm thicker. Everything else was the same except for this thickness, and he only wanted $75 for it. I paid the $75 before he could change his mind, and said to myself I would make it fit somehow. I had visions of machining out the gearbox case so that the extra thickness would be accommodated, and all sorts of other ideas, until I though the best thing would be if the bearing could be made to the right size. So, what I did was to take apart the new bearing so I was left with the outer ring, and then got the outer ring from the old bearing, and put them both on the magnetic bed of my trusty Jones and Shipman surface grinder. I then sat there for about an hour, taking off about 5 thou at a time, until I had ground down the new ring to the exact same size as the old. I used plenty of coolant to keep the temperature down, and smoothed off the sharp edge a little at the end. You can see the situation in the picture here. The left hand thicker ring had to be ground down to the same height as the one on the right.

Well, this actually worked really well. When I assembled the new bearing back, it fitted perfectly.

Since the gearbox was apart at this stage, it was of course desirable to renew all the seals, bands and clutches. Now this gearbox is a Borg Warner 35 but mounted transversely. One of the most curious and notable features of this gearbox is that instead of drop gears from the crankshaft to the gearbox input, there is a chain drive on sprockets. Its official designation is BW35TA. Naturally, no one had seen one of these things for thirty years and it was impossible to locate a repair kit. With no genuine parts to be found, I had to settle for a generic BW35 kit which I found on Ebay for about $200. It had the clutches and one band, and some seals, with a few that didn't fit anywhere. However, it was worth renewing the clutches since they were all blackened and worn down to the metal. Doing this job on a BW35 is quite straight forward, and the workshop manual is excellent. The only real difficult part is getting the main servo piston seals in back into the bore. You need a special tool to compress the rubber as you slide the piston back in. Otherwise, it is well within the scope of most mechanically-minded people if you take your time.

Although the orange manual is excellent, there are a few things that need your attention if you happen to be doing this job. In the 1800 BW35TA, there are four clutch plates per clutch, not five (as supplied in the generic kit) and so one is initially surprised to have two left over at the end. The rear clutch drive plates are slightly dished and have to be reassembled with the dished sides all facing the same way. There is a serious mistake in some versions of the orange manual. Page L43, item 15 in Section referring to Fig. L68 says that the governor should be fitted with its cover place “towards the speedometer pinion” in the 1970 edition (Part No TP818), and “towards the differential pinion” in the 1974 edition (Part No TP818B). It is important to follow the later advice since if fitted towards the speedometer pinion, the oil holes in the governor will not line up with those in the shaft.

After a lot of time in this case, I got to the point of having the gearbox back together with only a small handful of parts left over. I made up some gaskets, and carefully torque all the bolts to the right specification, and wheeled it back under the car ready for the official lowering and reconnection.

Another few hours later (those who are experienced in these matters will I am sure sympathise) I got to the point of having to fill up with transmission oil. Now, when I was younger, you could buy oil for a BW 35 anywhere. Now, it is very difficult. You need to buy Type F oil. Nothing else will do. Most cars no longer use this oil, and I found that most shops don’t bother carrying it. The local Repco store had one litre left, other shops had none, and I eventually found two four litre packs at a Supercheap outlet, the only ones they had in stock. Having made my purchase and rushed home, I put a funnel in the filler tube and starting pouring it in. Half way through I thought I should just check to see nothing was coming out the other end, and knowing that I had new gaskets everywhere, and all the bolts torqued to the exact setting as specified by BMC, I was certain there would be no problem in this respect. Yes, you guessed it. There was a nice puddle of red oil there on the floor under the gearbox. I searched and searched for a leak and found none. What I did find was a piece of metal gauze brazed into the neck of the filler pipe, carefully camouflaged by BMC, which acted as a breather. The lesson was to pour the oil in slowly since if it backed up, you would be just pouring more out the breather than down into the gearbox. Luckily I only lost about a litre, so the rest went in the right way.

A quick wash of the hands, the bonnet was slapped down. I resisted the temptation to invite the rest of the family for a test run, and instead, gingerly backed down the drive and off down the street. It was marvellous. First class all the way. The noise had finally disappeared.

Having driven the auto now for a few months, I can say that it really is a pleasant drive. Evidently the gear change points are designed so that the engine revs barely rise above about 2000 rpm which makes things as stress free for the driver as it does for the engine. Many readers will already know that the low down torque of the 1800 is exceptional, but this, with the torque multiplication of the converter at low revs, really works well with the auto.

As some will remember, the automatic has a horizontal gear selector on the right hand side of the dash next to the air vent. Whenever someone stops to admire this car, it almost seems like a secret handshake when they go through the motions of the right hand selector action – an obvious well-loved feature long remembered by the many who owned one. I sincerely hope I own this car for some time. Its exceptional interior and engine bay is probably as close to a new Austin as I will get, and it is a great pleasure to own and drive. Thank you BMC.